DOCUMENT RESUME

ED 331 812 SP 033 043

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TITLE An Examination of the Reasons Why Teachers Change Teaching Jobs.
PUB DATE 7 Apr 91
NOTE 24p.; Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, IL, April 3-7, 1991).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Career Change; Elementary Secondary Education; *Labor Turnover; Longitudinal Studies; *Predictor Variables; Public Schools; *Public School Teachers; Regression (Statistics); Special Education Teachers; Student Characteristics; *Teacher Motivation; *Teacher Salaries; Teaching Experience
IDENTIFIERS Michigan

ABSTRACT

This paper investigates the reasons why teachers change teaching jobs, focusing on movements of teachers between rather than within districts. The dataset traces the careers of full-time Michigan public school teachers during the 1970s. To build the regression models, a discrete-time maximum likelihood method was used. The study is restricted to districts with stable to expanding enrollments to insure that teachers' job changes were voluntary, not driven by layoffs. A separate analysis was made of special education teachers who were in high demand at that time because of new state legislation mandating expansion of special education programs. Results indicate that the probability of a job change increases during the first two years of teaching, then steadily decreases so that there is almost no job movement after the fifth year of teaching. Findings indicate that teachers prefer larger districts to smaller ones, are more likely to leave districts with large numbers of students from families with low socioeconomic status, and are more likely to leave districts with relatively low salary scales. Estimates are made of the effects of salary increases on the probability of retaining experienced teachers in a district. (Author/IAH)

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AN EXAMINATION OF THE REASONS WHY TEACHERS CHANGE TEACHING JOBS

Paper Presented At The

Annual Meeting Of The

American Educational Research Association

April 7, 1991

Dennis Sweeney

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ABSTRACT

The purpose of this paper is to investigate the reasons why teachers change teaching jobs. I focus on movements of teachers between rather than within districts, since this permits the analysis of salary scales as a predictor of job change. The dataset traces the careers of fulltime Michigan public school teachers during the 1970s. To build the regression models, I used a discrete-time maximum likelihood method, which is particularly appropriate for analyzing longitudinal data.

The study is restricted to districts with stable to expanding enrollments to insure that teachers' job changes are voluntary, not driven by layoffs. Nonetheless, there was still evidence of a sluggish labor market among these districts. As a further refinement, a separate analysis was made of special education teachers, who were in high demand at that time because of new state legislation mandating expansion of special education programs.

Results indicate that the probability of a job change increases during the first two years of teaching, then steadily decreases so that there is almost no job movement after the fifth year of teaching. It was also found that teachers prefer larger districts to smaller ones, possibly because larger districts tend to have more promotion opportunities and resources.

There is evidence that teachers are more likely to leave districts with large numbers of students from families with low socioeconomic status (SES), as well as districts with relatively low salary scales. In this paper, estimates are made of the effects of salary increases on the probability of retaining experienced teachers in a district.

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AN EXAMINATION OF THE REASONS WHY TEACHERS CHANGE TEACHING JOBS

I. INTRODUCTION

During the past several years, enrollment levels have been increasing in school districts across the United States. A recent analysis of population trends indicates that this growth will continue at least through the year 2000./1/ With this growth comes increased job opportunities for teachers, which raises concerns about the ability of local school districts to retain the faculty they have. In addressing this issue, recent studies have focused on such topics as the adequacy of existing models to project teacher supply and demand, opportunity costs people pay to go into teaching, and the current levels of teacher supply./2/ While this research is very important, its primary focus is on teachers' decisions to enter or leave the teaching profession.

Increasing enrollments also create job opportunities for those who remain in teaching and have no intention of leaving. These teachers do not always stay in the same place, but frequently move to other schools, often in different districts./3/ Such movements can affect the supply of teachers to different types of districts since teachers with more experience may move to areas that are more desirable in terms of salary, location, or working conditions.

With the demand for teachers on the rise, it is important to learn more about why they change districts. Some economists have done prior studies on teacher job changes, [illegible]h the theoretical perspective coming from human capital theor[illegible] As part of this theory, it is hypothesized that workers become less likely to change jobs as they acquire "specific human capital," i.e., skills that are specific to a particular work place. For example, teachers should be less inclined to leave a district once they learn how to deal effectively with the principal, students and parents at the schools where they work. Based on this hypothesis, one would expect that the longer teachers remain in a given district, the less likely they are to move to another one because they have built up high levels of specific human capital.

A second hypothesis of human capital theory is that workers will leave firms that do not pay well or have adverse working conditions. Thus a teacher could leave one district for a higher paying job in another, or to get students who are easier to teach./4/ Some studies have also found that teachers move to larger districts rather than smaller ones, possibly because there are more opportunities for promotion or better resources in the larger districts./5/

Sociological studies of teaching place more emphasis on the importance of working conditions than on financial rewards. For example, Lortie argues that non-monetary rewards such as job satisfaction and fulfillment are more important to teachers than monetary rewards./6/ Since a great deal of literature has been written on the problems teachers have with students from families with low socioeconomic status (SES), it is reasonable to expect teachers to move from low to relatively high SES districts to increase their non-monetary rewards./7/

Based on these areas of interest, this paper focuses on the following research questions:

1. As teachers gain experience and build up specific human capital, do they also become less likely to change districts?

2. Are working conditions an important factor in a teacher's decision to change districts? For example, are teachers more likely to leave districts where the families have relatively low socioeconomic status compared with other districts? Are teachers more likely to leave smaller districts for better resources or promotion opportunities elsewhere?

3. Are teachers more likely to leave districts with relatively low salary scales? If so, to what extent might a higher salary affect a teacher's decision to leave a district, all other things being equal?

Although past research has focused on these questions, my study can be informative for two reasons. First, unlike past studies that examine teacher mobility from only one school year to another, this one uses a dataset that permits an examination of mobility over the first seven years of a teacher's career when nearly all job changes occur./8/ As a result, we can see where in their careers job changes by teachers are most likely to occur. A second reason why this study can be informative is that the analysis of the data is done with a method known as proportional hazards regression, which is particularly appropriate for analyzing longitudinal data. With this methodology, teacher behavior in the labor market can be modelled more accurately than in the past.

The dataset and methodology permit an estimation of models that are better predictors of teachers' job changes over time, and with variations in district characteristics and salary levels. Teacher salary is a particularly important variable since it represents an incentive that can be increased by local districts to retain valued teachers. This study can help answer a question that superintendants, legislators and other policy makers would legimately ask: "If we increase salary levels, does it buy us anything with respect to retention of experienced teachers in schools where they are most needed?" This study examines inter- rather than intradistrict job changes because in the dataset that is used, as well as nationwide, salary scales often vary among

districts, but generally not among schools within the same district. Such a focus permits an examination of salaries as an incentive to change jobs within the teaching profession.

II. THE DATASET

The dataset for this study comes from the Michigan State Department of Education and from a special tabulation of United States Census data on Michigan public school districts./9/ Three cohorts of teachers are included in the study: those who began teaching during the 1972-73, 1973-74, and 1974-75 school years. None of the personnel in the dataset had teaching experience prior to their year of entry into the Michigan public school system. The cohorts are pooled to insure that the dataset is sufficiently large for analysis.

During the period covered by this study, many districts experienced significant declines in enrollment, which resulted in teacher layoffs and subsequent reductions in opportunities for voluntary job changes among teachers. The biggest challenge that this study presents is one of finding a subgroup of teachers that clearly had opportunities for voluntary job changes. At first I tried to do this by limiting the study only to teachers from districts where enrollments were stable to expanding. However, in the course of analysis it was found that within this group, one category--those who teach special education--had a much higher incidence of job changes and appeared to be affected by salary and student SES levels in their job moves much more than other types of teachers.

Subsequent research found that in 1971 the Michigan State Legislature passed a law that significantly expanded special education programs, thus creating a high demand for teachers in this area./10/ As a result, it became clear that my best approach would be to focus on special education teachers since they probably had many more opportunities than other teachers to change teaching jobs according to their own personal preferences. The degree of job opportunities that these special education teachers had in the 1970's should be similar to that of teachers in the 1990's, when overall demand is on the increase in most subject areas. Since the dataset I had constructed included only about 200 special education teachers, I am currently in the process of reconstructing my dataset to include more special education teachers.

In this paper I report interim findings using two different sets of data: one large set that includes approximately 3,400 teachers from districts from stable to expanding enrollments, and a much smaller dataset of about 200 special education teachers from these same districts.

III. METHODOLOGY

To estimate a regression model that can predict teachers' job changes, a discrete-time maximum likelihood method is used, which is a form of proportional hazards regression. This methodology was first developed in the early 1970's, and is used extensively in the fields of economics, sociology and medical research. However, proportional hazards regression is rarely used in educational research, which is unfortunate since this methodology is particularly appropriate for analyzing longitudinal data when one is interested in predicting the occurrence of a particular event.

One important advantage that proportional hazards regression has over ordinary least squares regression is that it can deal more effectively with "censored" observations. Censoring can occur when an individual is no longer at risk of the event of interest. In this study, this happens when teachers leave the Michigan public school system. These teachers are of no further interest to the study because after leaving they are not at risk of changing districts. Censoring also takes place when teachers remain in the same district throughout the study's time frame. Beyond this period, it is not known what happens to these teachers because the data do not cover their entire careers.

With proportional hazards regression, full use is made of the information contained in censored observations since each case is included in the model estimate as long as the teacher is at risk of experiencing an event of interest. By contrast, the use of ordinary least squares regression would lead to adjustments that could bias the results, such as eliminating all censored observations or giving them arbitrary values.

Another important advantage of proportional hazards regression is that it permits the modeling of predictor variables over time. In this study, teacher salary scales and district enrollment levels are treated as time-varying. This was done because these variables are likely to change over time, and such changes could have a dramatic impact on teachers' decisions to change jobs. For salaries, first year values could be inadequate measures of monetary incentives since district payscales are not likely to change uniformly over time. The modeling of district enrollment over time serves as a means of controlling for this variable, which can have a dramatic effect on teachers' opportunities for voluntary job changes. For example, a teacher from a district with expanding enrollments is more likely to change jobs voluntarily than a teacher in a district with rapidly declining enrollments who may be forced to change jobs due to layoffs.

With proportional hazards regression, the dependent variable is the "hazard rate," which is often simply referred to as the "hazard." In my model, the hazard rate is the probability that a teacher changes districts in a given year. From this model I can estimate these probabilities, given the values of different

predictors such as teacher gender, district enrollment and the socioeconomic status of a district's residents.

Logistic regression functions are often used to express discrete-time models. A simple model, with one time-invariant and one time-variant predictor, can be written as follows:

$$h(t) = 1/[1 + \exp(-a(t) - (b_1 x_1 + b_2 x_2(t)))]$$

where $h(t)$ is the hazard rate, x_1 is a predictor that does not vary with time, and x_2 is a time-varying covariate. The coefficients b_1 and b_2 give the change in the log hazard for each one-unit increase in their respective predictors. The intercept $a(t)$ refers to a set of constants representing each unit of time in the dataset. In my study these units represent each teacher's year of teaching.

In constructing the discrete-time model, the unit of analysis is not the teacher, but the teacher-year, i.e., a teacher working during a specific one-year period. Each year that a teacher works is recorded by adding a teacher-year to the dataset, which includes the dependent variable and all predictors. The hazard rate is estimated by using logistic regression to model the dichotomous outcome measure that indicates whether or not the teacher changed districts. This variable is coded zero for any year that the teacher remains in the same district, and 1 when a district change is made. Using the teacher-year instead of the teacher as the unit of analysis permits the modeling of the hazard rate and selected predictors in the model over time since the values of these variables can change from one teacher-year to another./11/

While the proportional hazards model can tell us about districts that teachers move from, they do not contain information comparing teachers' districts of origin with their destination districts. To make this comparison, I took the subset of teachers who changed districts and examined the mean ratios of new-to-old districts for variables such as SES levels and district salary scales. In addition, I used ordinary least squares regression on this subset. In each of these models, one of the new-to-old district ratios was the dependent variable, while teacher demographics, subject areas and district characteristics served as predictors. With this method I was able to look at what types of teachers moved into higher-paying jobs and higher SES districts.

IV. RESULTS

Table 1 on page 6 shows results from the larger of the two datasets, which includes all types of teachers from districts with stable to expanding enrollments. These results come

(continued on page 10)

Table 1. Fitted discrete-time hazard model for full-time Michigan public school teachers; dependent variable: teacher did/did not change districts (N = 3,418).

Variable /a	Coefficient
Intercept	3.495**
Teacher Demographic Characteristics	
Age	-0.049**
Female	-0.293**
Black	1.894**
Subject Area Taught	
Vocational education	0.928**
Physical education	0.518
Business education	0.689
Special education	3.479***
Art, Music	0.161
Academic subjects /b	0.490*
District Characteristics	
Logged district enrollment	-0.444***
SES index (1-100) /c	-0.007
Starting salary(000s) /d	-0.057

Table 1 Continued

Variable	Coefficient
Average annual salary increase (00s)	0.010
Cohort Year	
1973-74 or 1974-75 /e	-0.605**
Year of Teaching	
Year 2	0.310
Year 3	-0.370
Year 4	-0.414~
Year 5	-0.369
Year 6	-0.627**
Year 7	-0.829***
Interaction Terms	
1973-74 & 1974-75 cohorts, Year 2	0.259
1973-74 & 1974-75 cohorts, Years 3-7	1.581**
R-square /f	.064
P-value /g	.0001

a. Each coefficient, b, has been transformed by taking (exp(b) - 1), so that it indicates the percentage change in the probability of a district move for every unit change in the predictor. For example, the gender variable has a coefficient of -.293, which means that for female teachers the predicted probability is about 29 percent less than that of males. With logistic regression, this transformation is an approximation.

Table 1 Continued

P-values come from t-tests of the null hypothesis that coefficients are equal to zero or, in the case of categorical variables, to the base category. These tests were done before the coefficients were transformed.

P-values are represented as follows:

-	=	$p < .10$;
*	=	$p < .05$;
**	=	$p < .01$;
***	=	$p < .001$.

b. Academic subjects include English, physical and life sciences, mathematics, social sciences, and foreign languages. These subjects were pooled into one variable after testing the null hypothesis that their separate coefficients in another model were the same. This can easily be done by computing a t-statistic for each pair of coefficients (b_1,b_2) using the following formula:

$$t = (b_1 - b_2)/s.e.(b_1 - b_2)$$

where the denominator is the standard error of the difference between the two equations. For the five academic subjects, null was not rejected for any of the pairings.

c. Details on the creation of this index are found in Appendix D, page 122.

d. All salary values have been inflated to 1987 dollars using the U. S. Department of Commerce Consumer Price Index as reported in the Department of Labor's Monthly Labor Review, January 1974, p. 112 and June 1987, p. 91.

e. This is a dummy variable indicating whether the teacher is in the two later cohorts, as opposed to the earliest one used in this study. This coefficient is both large and negative, which probably results from the steady enrollment decline that occurred in Michigan and the nation as a whole during the 1970s. This decline must have resulted in fewer opportunities to voluntarily change jobs for teachers who entered the profession after 1972-73. Since this variable interacts with time, I also include a cohort-time interaction term in the model to control for all cohort effects that were found.

f. The R-square statistic is calculated as follows:

$$\text{R-square} = (\text{model } \chi^2)/(-2L(0))$$

Table 1 Continued

where L(0) is the maximum log-likelihood with only intercepts in the model. The statistic represents the degree to which the total log-likelihood is reduced by the added variables in the model. The statistic is conceptually similar to the R-square used in ordinary least squares regression. Its square root, R, has a range of -1 to +1. See SAS Institute, SUGI Supplementary User's Guide, p. 271 (referenced in the bibliography).

g. The p-value comes from testing the null hypothesis that the model has the same log-likelihood as a model with an intercept term but no variables.

from a discrete-time model for full-time teachers, and can be used to answer the three research questions stated in Section I.

A. Teacher Experience

My first research question focuses on the effect of teaching experience on a teacher's probability of changing districts. Based on the "year of teaching" coefficients, the hazard rate increases from the first to the second year, and then decreases with experience. This pattern is illustrated in Figure 1 on page 11, which shows a plot of the predicted hazard rate against time for female elementary school teachers. The plot indicates that the predicted hazard peaks at .025 in Year 2 and drops to almost zero by Year 6, so that virtually all job movements occur within the first five years of teaching.

The increase in the hazard rate from Years 1 to 2 may indicate a preference on the part of district administrators for experienced teachers, so that more alternative job opportunities are available after two years of teaching. The steady decline in the hazard after the second year would support human capital theory, which holds that workers are less likely to change jobs as they acquire skills that are specific to a particular work place. It can also be argued that this decrease is caused by more experienced teachers getting rewards such as higher salaries and favorable teaching assignments that may not be available if they changed districts.

B. District Working Conditions

The second research question focuses on working conditions. In Table 1 the model gives two variables that are reflective of a district's working conditions. First, there is district enrollment level, since large districts are likely to have more resources, a more diverse curriculum and more promotion opportunities than smaller districts. In addition, a more populous, urbanized area is likely to provide other amenities, such as cultural attractions and entertainment, that make the district attractive. A second variable that reflects working conditions is student socioeconomic status, since students from low-SES families are generally viewed by teachers as relatively difficult to teach.

1. District Enrollment

In Table 1, the large negative coefficient for the enrollment variable indicates that the smaller a district, the more likely a teacher is to leave it. Table 2 on page 12 includes only teachers who changed districts and compares the ratios of their new to old districts for selected variables. The table shows that teachers not only move out of smaller districts, but that they also move into larger ones. On the average, a teacher's new

(continued on page 13)

Figure 1. Fitted plot of hazard rate against time. The plot represents predicted hazard rates from the model in Table 4.1 for full-time white female elementary school teachers, age 23. Median values of district variables were used in the estimates.

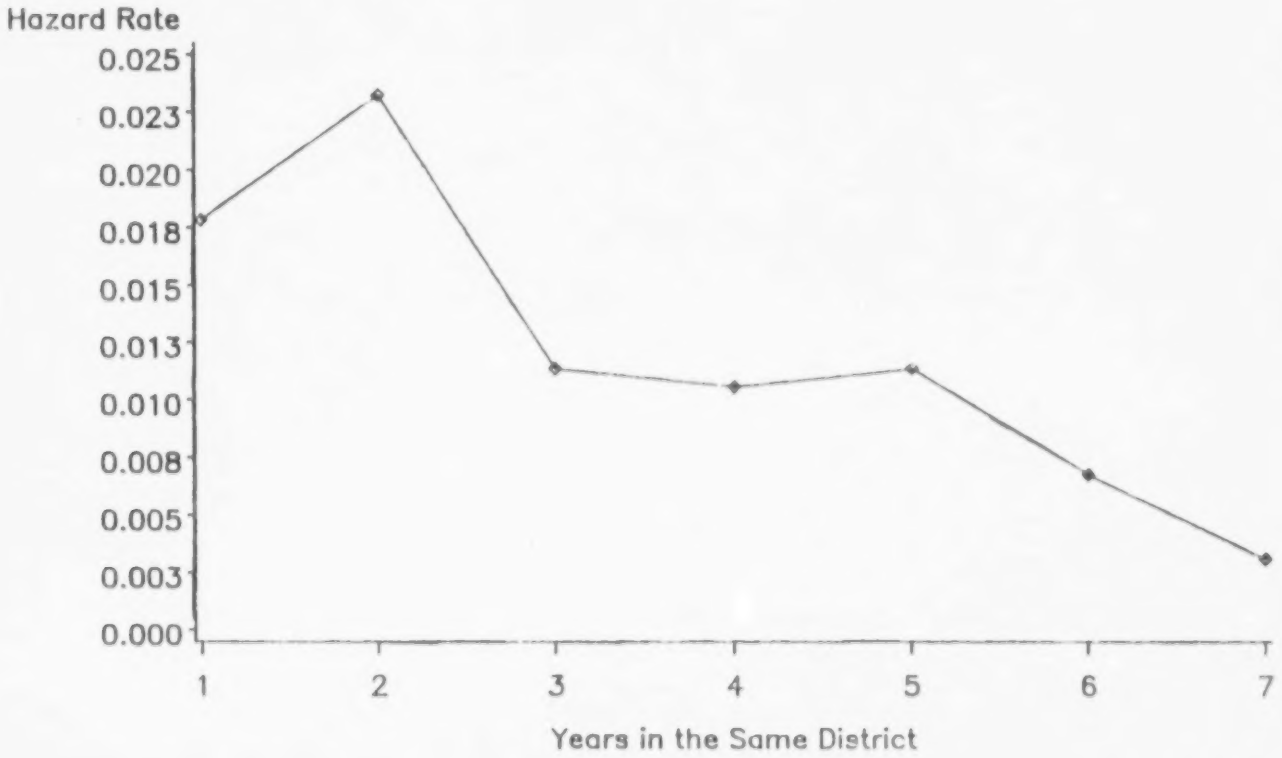

Table 2. Mean ratios of new to old districts and the standard deviations for key district characteristics; full-time movers only.

Variable	N of Cases /a	Mean Ratio /b	Std. Dev.
Enrollment level	268	2.37	4.49
SES index (1-100)	269	1.04	0.25
Base salary	268	1.03	0.12
Avg. annual sal. increase	266	1.03	0.29

a. Although the dataset contains 299 full-time teachers who changed districts, some cases were eliminated because the value for the new district was missing.

b. For each variable listed, this value is computed by taking the ratio between the teacher's new district and the district of origin, and then calculating the mean of this ratio.

district was about twice the size of the old one.

2. Socioeconomic Status of District Residents

Principal components analysis was used to create a composite measure of socioeconomic status consisting of four district-level variables:

median family income;
percentage of children under age 18 living below the Federal poverty line;
percent of adults in professional positions;
median educational level of the adult population.

The composite SES index has been scaled so that it has a range of 1-100. Based on the hazard model in Table 1, the SES level in the teacher's district of origin does not appear to be a good predictor of interdistrict job changes. However, a separate analysis of movers showed that special education teachers were much more likely than other teachers to move into higher SES districts (see Table 3, p. 14). It is possible that special education teachers were the only group for which there was sufficient demand to create opportunities for movement into higher SES districts.

C. Salary Incentives

In assessing their employment situations, teachers will not only look at how much money they are currently making, but also at what they can expect to make in the future. To accommodate these expectations in the regression models, I used two variables measuring each district's salary scale: starting salaries and average annual increments. These variables represent compensation schedules for each district and vary over time in the model so that they reflect any changes brought about by negotiated wage agreements. To correct for inflation, all values are expressed in 1987 dollars.

Based on the hazard model in Table 1, neither the base salary nor the annual increment in the teachers' districts of origin appear to be important predictors of job changes. However, a different picture is presented in Table 3, which shows models that included movers only, with ratios of teachers' new to old district salary scales as dependent variables. The model with base salary as the dependent variable shows that special special education teachers were the only group showing an increase in salary resulting from a job change. As with district SES, this finding raises a question about the effect of the sluggish teacher labor market in the 1970's and the possibility that reduced alternative job opportunities could prevent salary variable from showing up as important predictors. Such an effect could be present despite my efforts to control for it by looking at teachers from districts with stable to expanding enrollments.

(continued on page 16)

Table 3. Fitted ordinary least squares regression models for full-time teachers who moved during their first seven years of teaching; dependent variables: logged ratios of teacher's new to old district for starting salary, annual salary increment, and socioeconomic status.

Predictor Variables /a	Dependent Variables (ratio of new dist. to old dist.) Logged Starting Sal. Ratio (N = 268)	Logged Sal. Increase Ratio (N = 266)	Logged SES Index Ratio (N = 269)
Intercept	0.076	0.869***	0.684**
	Demographic Characteristics		
Entry age	-0.001	0.007	0.001
Female	-0.010	0.063~	0.033
Black	0.071	-0.043	-0.311***
	Subject Areas		
Vocational education	0.021	-0.152*	-0.047
Physical education	0.020	0.087	0.017
Business education	-0.005	-0.154	0.034
Special education	0.076***	-0.028	0.087~
Art & music	0.013	-0.075	0.078
Academic subjects/a	-0.005	-0.005	0.010

Table 3 Continued

Predictor Variables /a	Dependent Variables (ratio of new dist. to old dist.) Logged Starting Sal. Ratio (N = 268)	Logged Sal. Increase Ratio (N = 266)	Logged SES Index Ratio (N = 269)
Characteristics of Old District			
Logged dist. enrollment	0.001 (0.012)	-0.114*** (0.029)	-0.038 (0.028)
SES index (1-100)	-0.001 (0.001)	-0.004 (0.002)	--
Starting /b salary (000s)	--	--	-0.018* (0.009)
Annual sal. increase (00s)	--	--	-0.008 (0.009)
R-square	0.067	0.164	0.107
P-value	.080	.0001	.003

a. Academic subjects include English, physical and life sciences, mathematics, social sciences and foreign languages.

b. Variables are not included as predictors in a model if they are conceptually similar to the dependent variable. Thus the annual salary increment is not in the first model with starting salary as the dependent variable, nor is starting salary in the second model where the annual salary increment is the dependent variable.

One way to check for this "sluggish labor market" effect is to estimate the same type of hazard model in Table 1 for special education teachers only. Such a model, shown in Table 4 on page 17, does indicate that starting salary is an important predictor. This model can shed some light on the cost of retaining teachers in a district when there is a high demand for them in the labor market.

Table 5 on page 19 shows the predicted probabilities of changing districts, based on the special education model, after seven years on the job for different starting salary values, with all other variables held constant. Special education teachers with starting salaries at the tenth percentile of the distribution ($16,593) have a predicted district change probability of .61, compared with just .25 for teachers at the ninetieth percentile ($21,135). This means that districts with a starting salary at the tenth percentile of the distribution would have to provide a 27 percent increase in base salary to reduce the district change probability from .61 to .25 (assuming all other factors are equal). However, a more modest base salary increase of 13 percent, which would raise salaries to the median ($18,730), would still lower the seven-year district change probability by about one-third, from .61 to .42.

V. CONCLUSION

My analysis to date indicates that nearly all teacher job changes take place early in their careers, with the probability of a job move dropping to nearly zero after the fifth year of teaching. It was also found that teachers prefer districts with relatively high enrollment levels. While the model containing all types of teachers showed no evidence that district SES or salary scales affected the probability of a job change, such effects were found in separate analyses of special education teachers. In the early 1970's, new special education legislation went into effect in Michigan, which no doubt created more opportunities for teachers in this area that other teachers did not have.

It appears that the next step in this project would be a further analysis of special education teachers since they clearly had the most opportunities for voluntary job transfers. The number of special ed. teachers in my current dataset (about 200) is small and may not be representative. I therefore plan to reconstruct the dataset to include special education teachers from all districts, not just those with stable to expanding enrollment, since it is likely that all special education teachers had significant opportunities for voluntary transfers during the time period covered by the study. Such a focus can give us a better idea of the effect that a salary increase can have on retaining teachers in districts that are viewed as less desirable, such as those with many low-SES students.

Table 4. Fitted discrete-time hazard model for full-time special education teachers only; dependent variable: teacher did/did not change districts (N = 209).

Variable	Coefficient
Intercept	9.915* /a
Teacher Demographic Characteristics	
Age	-0.127*
Female	-0.104
Black	7.820*
District Characteristics	
Logged district enrollment	-0.315
Socioeconomic status	-0.014
Starting salary(000s)	-0.271*
Average annual salary increase (00s)	0.028
Cohort Year	
1973-74 or 1974-75	-0.729~
Year of Teaching	
Year 2	-0.067
Year 3	-0.428
Year 4	-0.666
Year 5	-0.789
Year 6	-0.682
Year 7	-0.913~

Table 4 Continued

Variable	Coefficient
Interaction Terms	
1973-74 & 1974-75 cohorts, Year 2	0.321
1973-74 & 1974-75 cohorts, Years 3-7	1.025
R-square	.078
P-value	.058

a. P-values are represented as follows:

~ = p < .10;
* = p < .05.

Table 5. Predicted seven-year hazards of district change, full-time special education teachers with different levels of starting salary.

Percentile of Base Salary Distribution	Base Salary in 1987 Dollars	District Change Probability
Tenth /a	$16,593	.613
Fiftieth	$18,730	.419
Ninetieth	$21,135	.247

a. In estimating these district change probabilities, all other variables in the equation are held constant. For continuous variables, these constant values are their medians. Constant values for categorical variables include female for gender and white for race.

NOTES

1. National Center for Education Statistics, Projections of Education Statistics to the Year 2000, U. S. Department of Education, Office of Educational Research and Improvement, December 1989, pp. 11, 78.

2. See, for example, Gus W. Haagstrom, Linda Darling Hammond, David W. Grissmer, " Assessing Teacher Supply and Demand," (Rand Corporation, Santa Monica CA, June 1986); Richard J. Murnane, Judith D. Singer, John B. Willett, "The Career Paths of Teachers: Implications for Teacher Supply and Methodological Lessons for Research," Educational Researcher, Vol. 17 (August-September 1988); Richard J. Murnane, Randall J. Olsen, "The Effects of Salaries and Opportunity Costs on Duration in Teaching: Evidence from Michigan," Review of Economics and Statistics, Vol. 71, No.

3. Such movement was frequently found in David Greenberg and John McCall, "Teacher Mobility and Allocation," The Journal of Human Resources, Vol. 9, No. 4, Fall 1974, p. 15; William H. Baugh, Joe A. Stone, "Mobility and Wage Equilibration in the Educator Labor Market," Economics of Education Review, Vol. 2, No. 3 (Summer 1982), p. 268; Richard J. Murnane, "Teacher Mobility Revisited," The Journal of Human Resources, Vol. 16, No. 1, (Winter 1981), p. 8.

4. Human capital theory is discussed in Greenberg and McCall, op. cit., pp. 481-482; and in Gary Becker, Human Capital, (New York: National Bureau of Economic Research, 1964), pp. 1-15, 19-20.

5. E.g., Greenberg and McCall, op. cit., p. 20.

6. Dan C. Lortie, Schoolteacher, (Chicago: University of Chicago Press, 1975), pp. 26-31.

7. See, for example, Herbert Kohl, 36 Children, (New York: The New American Library, 1967), p. 20; James Comer, School Power, (New York: The Free Press, 1980), p. 61; and Mary Hayward Metz, Classrooms and Corridors, (Berkeley: University of California Press, 1978), pp. 105-109.

8. I actually had data on teachers that covered their first twelve years of teaching. In the initial analysis, it was found that by the seventh year, the probability of a job change drops to nearly zero and does not rise again through year twelve. It was therefore thought sufficient to study the first seven years.

9. The Mighigan dataset was one of three compiled as part of a research project headed by Richard J. Murnane. The Michigan Department of Education provided raw data tapes from records kept on all public school teachers, schools and school

districts in the state. Census data for Michigan school districts came from the following source: "1980 Census of Population and Housing, Process and Products: Public Elementary and Secondary School systems," (National Center for Education Statistics, February 1983).

10. This was Public Law 198 of 1971. The law mandates that the State Board of Education shall develop a plan for special education programs and services designed to develop "the maximum potential of every handicapped person." See State of Michigan, Public and Local Acts of the Legislature of the State of Michigan Passed at the Regular Session of 1971 (Department of Administration, 1971).

11. An articulate explanation of discrete-time proportional hazards models is given by Paul D. Allison, Event History Analysis, (Berverly Hills CA: Sage Publications, 1984), pp. 14-22.